

1 CLAIMS:

2 1. A capacitor fabrication method comprising:

3 forming a first capacitor electrode over a substrate;

4 atomic layer depositing a conductive barrier layer to oxygen
5 diffusion over the first electrode;

6 forming a capacitor dielectric layer over the first electrode; and

7 forming a second capacitor electrode over the dielectric layer.

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9 2. The method of claim 1 wherein the atomic layer depositing
10 occurs at a temperature of from about 100 to about 600 °C and at a
11 pressure of from about 0.1 to about 10 Torr.

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13 3. The method of claim 1 wherein the atomic layer deposited
14 barrier layer has a thickness of from about 50 to about 500 Angstroms.

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16 4. The method of claim 1 wherein the atomic layer deposited
17 barrier layer contacts one of the first or second electrodes.

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19 5. The method of claim 1 wherein the atomic layer deposited
20 barrier layer comprises WN, WSiN, TaN, TiN, TiSiN, Pt, Pt alloys, Ir,
21 Ir alloys, Pd, Pd alloys, RuO_x, or IrO_x.

1 6. The method of claim 1 wherein the dielectric layer exhibits
2 a K factor of greater than about 7 at 20 °C.

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4 7. The method of claim 1 wherein at least one of the first or
5 second electrodes comprise polysilicon and the dielectric layer comprises
6 oxygen.

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8 8. The method of claim 1 wherein the dielectric layer comprises
9 Ta₂O₅, ZrO₂, WO₃, Al₂O₃, HfO₂, barium strontium titanate, or strontium
10 titanate.

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12 9. The method of claim 1 wherein the dielectric layer is over
13 the barrier layer.

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15 10. The method of claim 9 further comprising atomic layer
16 depositing another conductive barrier layer to oxygen diffusion over the
17 dielectric layer.

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19 11. The method of claim 1 wherein the forming the electrodes
20 and the dielectric layer occur by other than atomic layer deposition.

1 12. The method of claim 1 further comprising cleaning the first
2 electrode prior to the atomic layer depositing by a method comprising
3 HF dip, HF vapor clean, or NF_3 remote plasma.
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1 13. A capacitor fabrication method comprising:
2 forming a first capacitor electrode over a substrate;
3 chemisorbing a layer of a first precursor at least one monolayer
4 thick over the first electrode;
5 chemisorbing a layer of a second precursor at least one monolayer
6 thick on the first precursor layer, a chemisorption product of the first
7 and second precursor layers being comprised by a layer of a conductive
8 barrier material;
9 forming a capacitor dielectric layer over the first electrode; and
10 forming a second capacitor electrode over the dielectric layer.

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12 14. The method of claim 13 wherein the first and second
13 precursor layers each consist essentially of a monolayer.

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15 15. The method of claim 13 wherein the first and second
16 precursor layers each comprise substantially saturated monolayers.

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18 16. The method of claim 13 wherein the first and second
19 precursor each consist essentially of only one chemical species.

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21 17. The method of claim 13 wherein the first precursor is
22 different from the second precursor.

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1 18. The method of claim 13 wherein the first and second
2 precursors respectively comprise only one of the following pairs:
3 WF_6/NH_3 , $\text{TaCl}_5/\text{NH}_3$, $\text{TiCl}_4/\text{NH}_3$, tetrakis(dimethylamido)titanium/ NH_3 ,
4 ruthenium cyclopentadiene/ H_2O , $\text{IrF}_5/\text{H}_2\text{O}$, organometallic $\text{Pt}/\text{H}_2\text{O}$.

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6 19. The method of claim 13 wherein the dielectric layer is over
7 the barrier layer, further comprising chemisorbing additional alternating
8 first and second precursor layers before forming the dielectric layer.

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10 20. The method of claim 19 wherein the barrier layer has a
11 thickness and a density effective to reduce oxidation of the first
12 electrode by oxygen from over the barrier layer.

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14 21. The method of claim 19 wherein the barrier layer has a
15 thickness of from about 50 to about 500 Angstroms.

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17 22. The method of claim 13 wherein the barrier layer comprises
18 WN , WSiN , TaN , TiN , TiSiN , Pt , Pt alloys, Ir , Ir alloys, Pd , Pd alloys,
19 RuO_x , or IrO_x .

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21 23. The method of claim 13 wherein the dielectric layer exhibits
22 a K factor of greater than about 7 at 20 °C.

1 24. The method of claim 13 wherein at least one of the first or
2 second electrodes comprises polysilicon and the dielectric layer comprises
3 oxygen.

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5 25. The method of claim 13 wherein the dielectric layer
6 comprises Ta_2O_5 , ZrO_2 , WO_3 , Al_2O_3 , HfO_2 , barium strontium titanate, or
7 strontium titanate.

1 26. A capacitor construction comprising a first capacitor electrode
2 over a substrate, a capacitor dielectric layer over the first electrode, a
3 second capacitor electrode over the dielectric layer, and an atomic layer
4 deposited conductive barrier layer to oxygen diffusion between the first
5 and second electrodes.

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7 27. The construction of claim 26 wherein the dielectric layer is
8 over the barrier layer.

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10 28. The construction of claim 27 further comprising another
11 conductive barrier layer to oxygen diffusion over the dielectric layer.

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13 29. The construction of claim 26 wherein the barrier layer
14 comprises WN, WSiN, TaN, TiN, TiSiN, Pt, Pt alloys, Ir, Ir alloys, Pd,
15 Pd alloys, RuO_x, or IrO_x.

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17 30. The construction of claim 26 wherein the dielectric layer
18 exhibits a K factor of greater than about 7 at 20 °C.

1 31. A capacitor construction comprising:
2 a first capacitor electrode over a substrate;
3 a conductive barrier layer to oxygen diffusion over the first
4 electrode, the barrier layer comprising a chemisorption product of first
5 and second precursor layers;
6 a capacitor dielectric layer over the first electrode; and
7 a second capacitor electrode over the dielectric layer.

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9 32. The construction of claim 31 wherein the barrier layer
10 comprises WN, WSiN, TaN, TiN, TiSiN, Pt, Pt alloys, Ir, Ir alloys, Pd,
11 Pd alloys, RuO_x, or IrO_x.

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13 33. The construction of claim 31 wherein the dielectric layer
14 exhibits a K factor of greater than about 7 at 20 °C.